

SUPER II VZ200 MODIFICATION

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The VZ200 computer was one of the earliest of the really cheap, low performance computers on the market and as such it gained a loyal following. Over time, however, it's started to look a little too down-market. Its memory is ridiculously small, its keyboard is horrible and it lacks a number of features other computer users take for granted.

THERE ARE TWO solutions to this problem. One is to throw it away and buy a Microbee. The other is to be a bit more adventurous and see what can be done with the old carcass. In this project we show you how to increase the memory, fit a new keyboard, make it run faster, upgrade the power supply and provide a reset facility. You may carry out any or all of these modifications, as time, experience and inclination allow. It's called the Super II, for want of a better name.

Keyboard

The keyboard used in the prototype was a Digitran Golden Touch keyboard from Dick Smith. It was dirt cheap, as the keys had been coated with solder mask. Having cleaned and tinned the connections, it was as good as new. Another suitable keyboard is the Microbee.

If a numeric keypad is available, then this too can be connected, by means of the extra switches in parallel with the ones on the keyboard. On the prototype, the keypad included the digits 0 to 9, a period (.) and a RETURN key. If switches are not marked correctly, (eg, with graphic symbols), then these can be simply re-marked.

To start, remove any interface board from the keyboard. If the keys are a part of this board simply disable the interface circuit by cutting any tracks to it. By cutting tracks (on a pcb-based keyboard) and linking keys together, arrange the keys to form the matrix shown in Figure 1. With a keyboard using separate keys (eg, the Microbee), simply use wires to hook the keys together.

Extra keys, such as SHIFT-LOCK, LINE FEED or ESCAPE, should be left uncon-

nected or removed if possible. On the prototype, only 58 of the 101 keys were used, the rest were removed and the holes covered with black insulation tape.

Additional keys such as a numeric keypad, can be wired in parallel with the key they correspond to. Shift keys should be wired in parallel.

Most keys will not be correctly marked for the VZ200. If this is the case, use Liquid Paper or similar to cover over the incorrect mark, and also over blank areas where a marking is required. Mark the key required by using a black pen or thin permanent texta.

If the keyboard is for the VZ200, then invert the colours or the graphics symbols on the keys (ie, black to white or vice versa). On the VZ300, the symbols have been corrected to the BASIC ROM. The colours can be marked on the keys 1 to 8 using the appropriate coloured permanent marker.

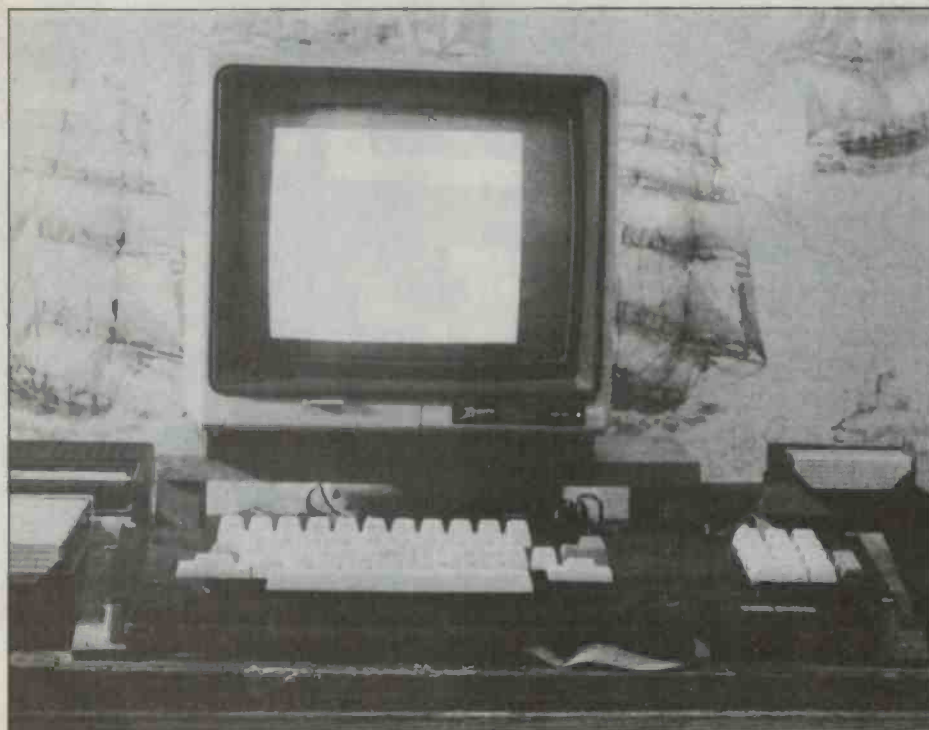
Control keys can be marked. On the prototype, only the control words for keys 1 to 8 were marked (ie, CSAVE/ CLOAD/ CRUN/ VERIFY/ LIST/ RUN/ END/ NEW). In addition, cursor control arrows, INSERT, RUBOUT, BREAK and INVERSE should be marked. Other keys may be marked, depending on your requirements.

When all the marking is complete, gently wipe each key with clear nail-polish. This protects the marking from being rubbed off, and provides a nice, silky finish to each key, if it is applied correctly!

Now that the keyboard is to your satisfaction, decide on the connector to be used. The prototype used a 16-pin DIP plug and a 16-pin IC socket. This is reasonably flat, and so can be mounted on the underside of the computer, but the IC socket is extremely hard to keep secure. Alternatively, a 15-pin D-connector can be mounted on the top of the computer (making sure it will fit when the lid is closed!), without the power supply connections.

Open the computer by removing the six back screws. Remove the four screws holding down the main pcb. Locate the 16 connections to the keyboard. Solder a wire on the track side of the pcb to each pad (see Figure 2). If +5V is required rather than the LED power signal, this can be obtained nearby. If no power indicator is required, the last two pads can be left without the extra wires.

Wire these new wires to the connector as shown in Figure 2. If a 16-pin DIP socket is used, cut a hole to suit in the bottom of the case, and use whatever you can to keep it there (Araldite, silicone rubber, plastic cement, etc). A 15-pin D connector can be mounted on the top of the case behind the "200" in the insignia. Make sure that the wire used is long enough, so that the case can be closed easily. In order to minimise wear, silicone rubber was smeared over the connections.



PARTS LIST — ETI-687

MEMORY BOARD

Capacitors:

- C1.....47 μ , 10V electrolytic
C2-6.....100n ceramic or similar

Semiconductors

- IC1.....74LS138
IC2.....6116
IC3-6.....6264

Plugs and sockets:

- SK1.....16-pin IC socket (for IC1)
SK2.....24-pin IC socket (for IC2)
SK3-6.....28-pin IC sockets (for IC3-6)
SK7,8.....15-pin Utilux socket (for main pcb)
SK9-12.....15-pin Utilux plugs (for both RAM boards)

Miscellaneous:

ETI-687 pc board; wire

Price estimate: \$60

KEYBOARD

Keyboard to suit: see text;

Socket and plug top suit: see text;

Wire;

Silicone rubber (optional);

Liquid Paper;

Black pen or thin permanent text;

Coloured textas — green, yellow, blue, red, buff, cyan, magenta and orange;

Clear nail polish.

Make up a cable from the keyboard, connecting the signals as shown in Figure 1 (ie, D0-D5 and A0-A7) to a suitable 15- or 16-pin connector. An LED may be connected across the power and 0V signals, if a 16-pin connector is used and these signals have been wired in place internally. The power signal, if replaced with +5V, may be used as desired.

Check your wiring. When everything appears to be correct, reassemble the computer, plug in the power and the video plugs *only*, and turn on. If the computer gives the correct sign on message, then all is well. Check that all the keys on the normal keyboard function correctly, then plug in the new keyboard.

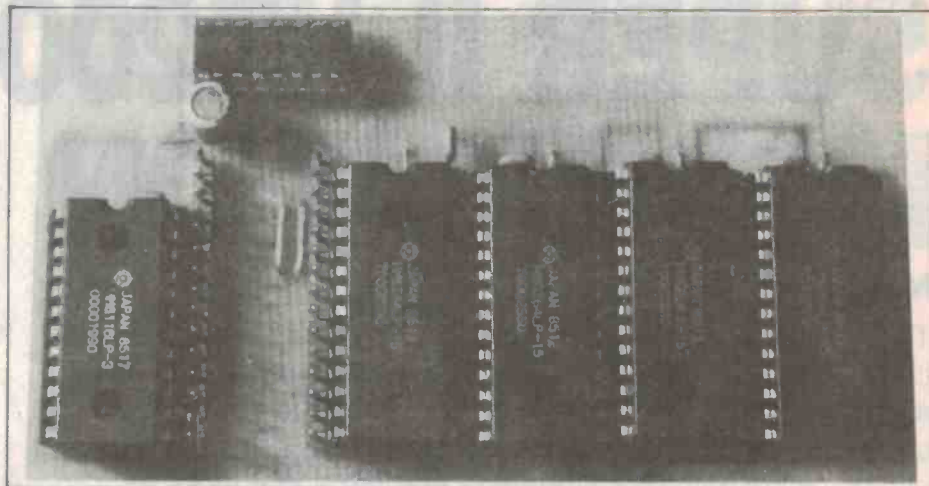
If everything has been wired properly, then the new keyboard should work. If the machine crashed when power was applied, reopen the box and look for both short and open circuits on the pcb. A multimeter is handy here. If the keyboard does not work, check your wiring.

You now have a keyboard to your satisfaction!

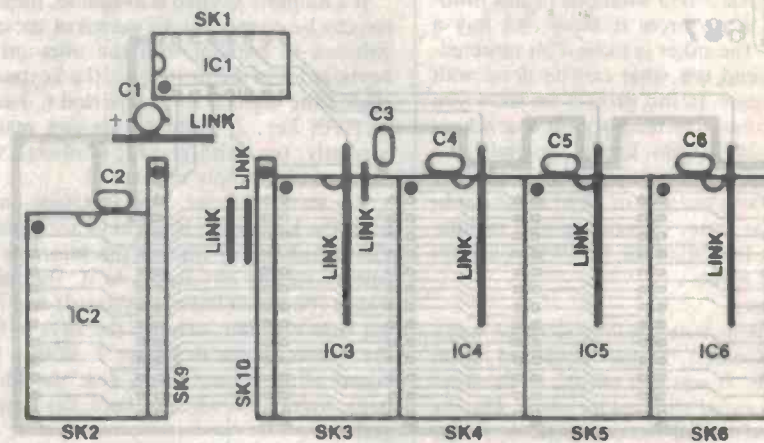
Memory

The new memory board replaces the standard 6K of the VZ200 with 34K of static RAM.

The design is relatively simple, using only five random access memories and an address decoder IC. This is because of the use of high density static RAMs which require almost no interfacing (unlike dynamic RAM, which requires multiplexed address



Memory board.



The completed keyboard with the computer beneath.

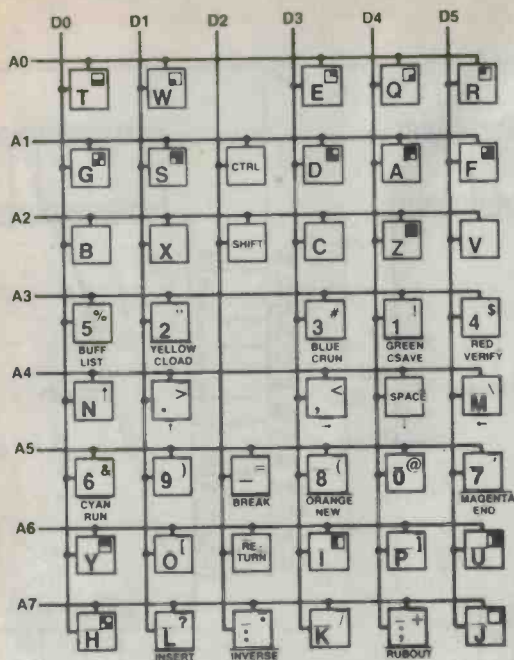


Figure 1. Keyboard matrix.

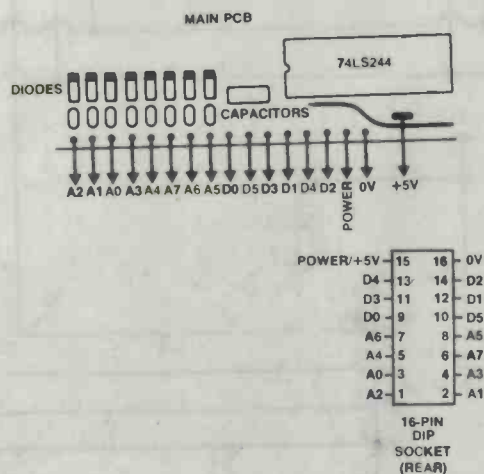


Figure 2. Wiring diagram.

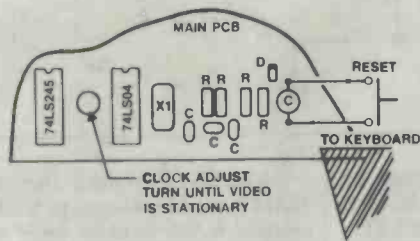


Figure 3. 74LS04 on VZ200.

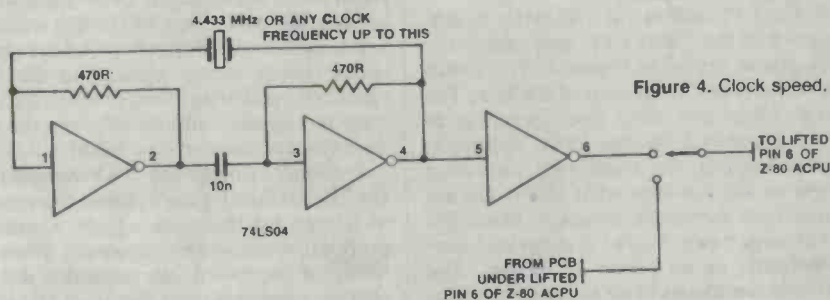


Figure 4. Clock speed.

lines plus refreshing) and are thus extremely easy to use. Two types are used: one 6116 2K RAM and four 6264 8K RAMs.

The pcb is single-sided and uses links in order to lower the cost. The board plugs in where the original board was fitted. Unfortunately, as sockets are used (the cost of the ICs makes this necessary), there is no room for the rf shield, however, I have found that there is no perceptible difference in the noise levels radiated by both shielded and unshielded computers.

34K is the maximum addressable RAM space in the VZ200 memory map. The expanded map looks like this:

0000-1FFFF: BASIX ROM 0
 2000-3FFF: BASIC ROM 1
 4000-67FF: reserved for ROM (eg DOS/RTTY etc)
 6800-6FFF: input/output latch
 7000-77FF: video RAM
 *7800-7FFF: 2K user RAM (6116)
 *8000-9FFF: 8K user RAM (6264)
 *A000-BFFF: 8K user RAM (6264)
 *C000-DFFF: 8K user RAM (6264)
 *E000-FFFF: 8K user RAM (6264)

All peripherals are compatible with this set-up (except, of course, for memory expansion modules).

To begin check that the pcb has been drilled correctly and that there are no short or open circuits (a lens is handy). Solder in the eight links first. It is a good idea to use single-strand insulated wire, as some wires come very close to other contacts.

Now solder in the two 15-pin Utilux plugs. These require 1mm holes instead of the 0.8mm holes elsewhere. Then solder in the six IC sockets which are crammed together rather tightly in order to reduce board size, so be careful. The bypass capacitors should now be inserted. Take care with C1, the electrolytic. Check the board and put it aside (no ICs yet!).

Attack the VZ200. Remove the six back screws, lift the lid carefully (the keyboard will still be connected) and remove the four screws holding down the pcb. Desolder the main switch and the speaker (note the wires), and desolder the four lugs of the rf shield from the earth tracks. On the top, remove any braid to the rf shield then remove the shield. Behold! The RAM board is visible. Cut the short cables leading to the RAM board from the main pcb, remove the insulation and desolder each wire.

The contacts must be cleaned so that the connector can be inserted. I used a solder sucker, desoldering braid and a needle to clear the holes. *Be careful!* Overheating does wonders to the main pcb. If you lift any track, put in a link to replace it.

Insert the two 15-pin Utilux sockets to the main pcb. Check for lifted tracks. At the moment the computer will not work. In case anything goes wrong, it is a good idea to fit

Project 687

HOW IT WORKS — ETI-687

MEMORY BOARD

The RAM ICs require a simple TTL power supply. The data pins are connected directly to the data bus, as are the address lines. WRITE ENABLE is connected to the Z80 WR signal, and the OUTPUT ENABLE is connected to the RD signal. The 6116 is selected by an address decoder on the main pcb. The 6264s are selected through the 74LS138.

When MREQ is low and A15 is high, the 74LS138 will decode one of four combinations, depending on the status of A13 and A14. These signals are sent to the 6264s to enable the correct IC.

When any of the ICs are enabled (\overline{CS} goes low), and a WR or RD signal is valid, the data bus will go out of tristate mode and either read data from the Z80 data bus into the address indicated on the address lines, or write data from the address on the address bus to the data bus. No other interfacing is required.

The decoupling capacitors are required for the stability of the power supply, as inductance occurs on the pcb with the power tracks.

KEYBOARD

The keyboard is continually scanned for any keys pressed. All address lines (A0-A7) are held low while the data bits (D0-D5) are checked. If any are found to be low then the computer knows that a key has been pressed and checks each address by holding the single address line low, and checking the data bits. SHIFT and CONTROL keys are also checked, and are used to derive the final character code.

Utilux connectors to the 6K RAM board for testing. To do this the holes must be widened to 1mm. If you do this, now is a good time to check that the computer still works by plugging in the 6K board, reconnecting the power and the speaker and turning on. If the normal message appears, then proceed, otherwise check the main pcb for short and open circuits (a lens and/or a multimeter is handy) and good luck!

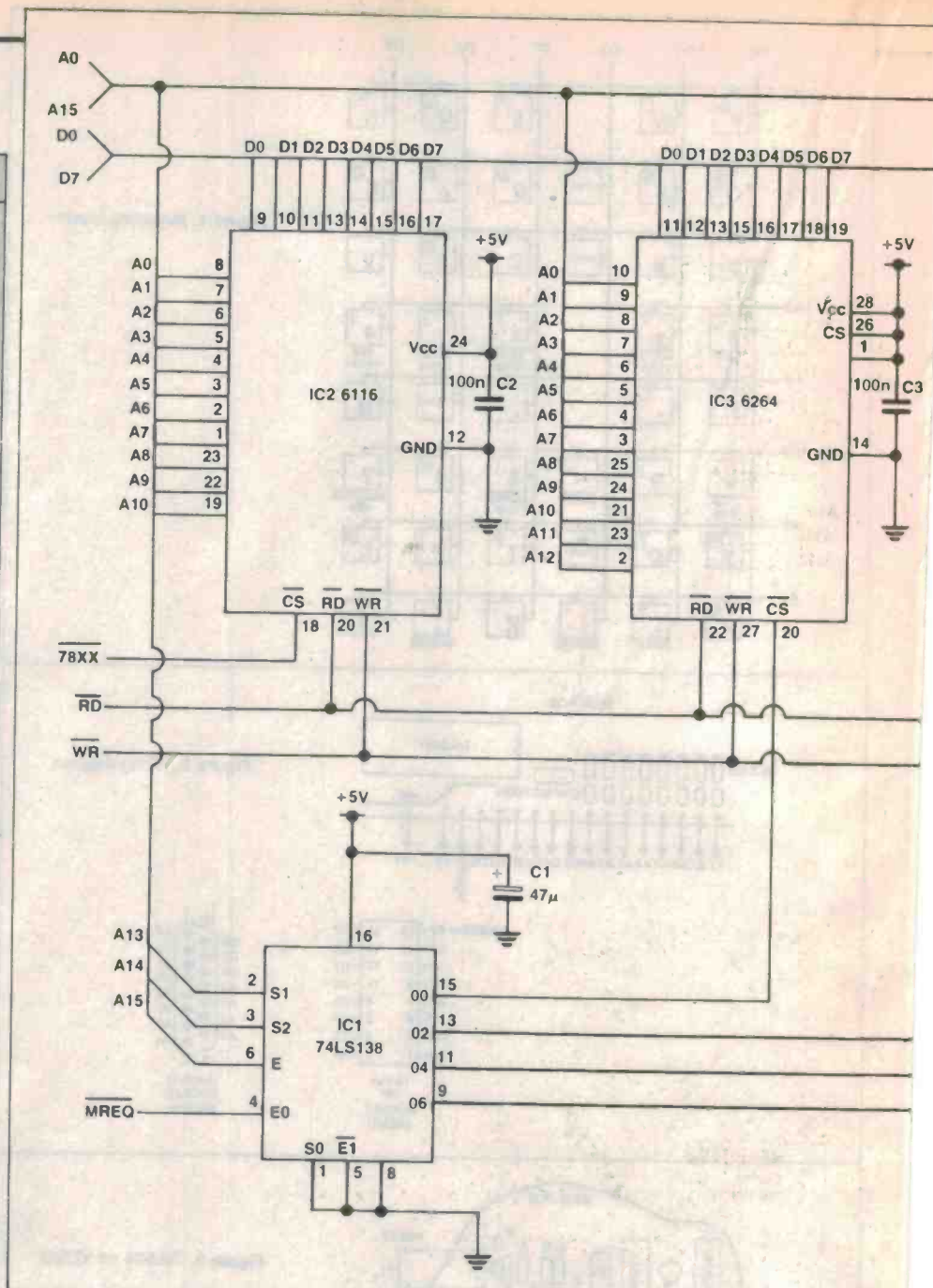
If all is well, insert the ICs into the new RAM board making sure they are inserted correctly then plug the board into the socket, making sure that all pins are in the right place. The board will not fit flatly into the socket because two RAMs get in the way, however the contacts are satisfactory.

Apply power. If the message appears (it will take longer than normal), then all is well. If not, check everything. Once again, good luck!

Once everything is working, screw down the main pcb and replace the back of the box. Test once more. Your VZ200 has 36K of RAM (including video RAM) . . . more than most home computers on the market!

Some other modifications

1. If the video signal wavers, then correct the clock speed by adjusting the variable capacitor by the 74LS04 on the main pcb.

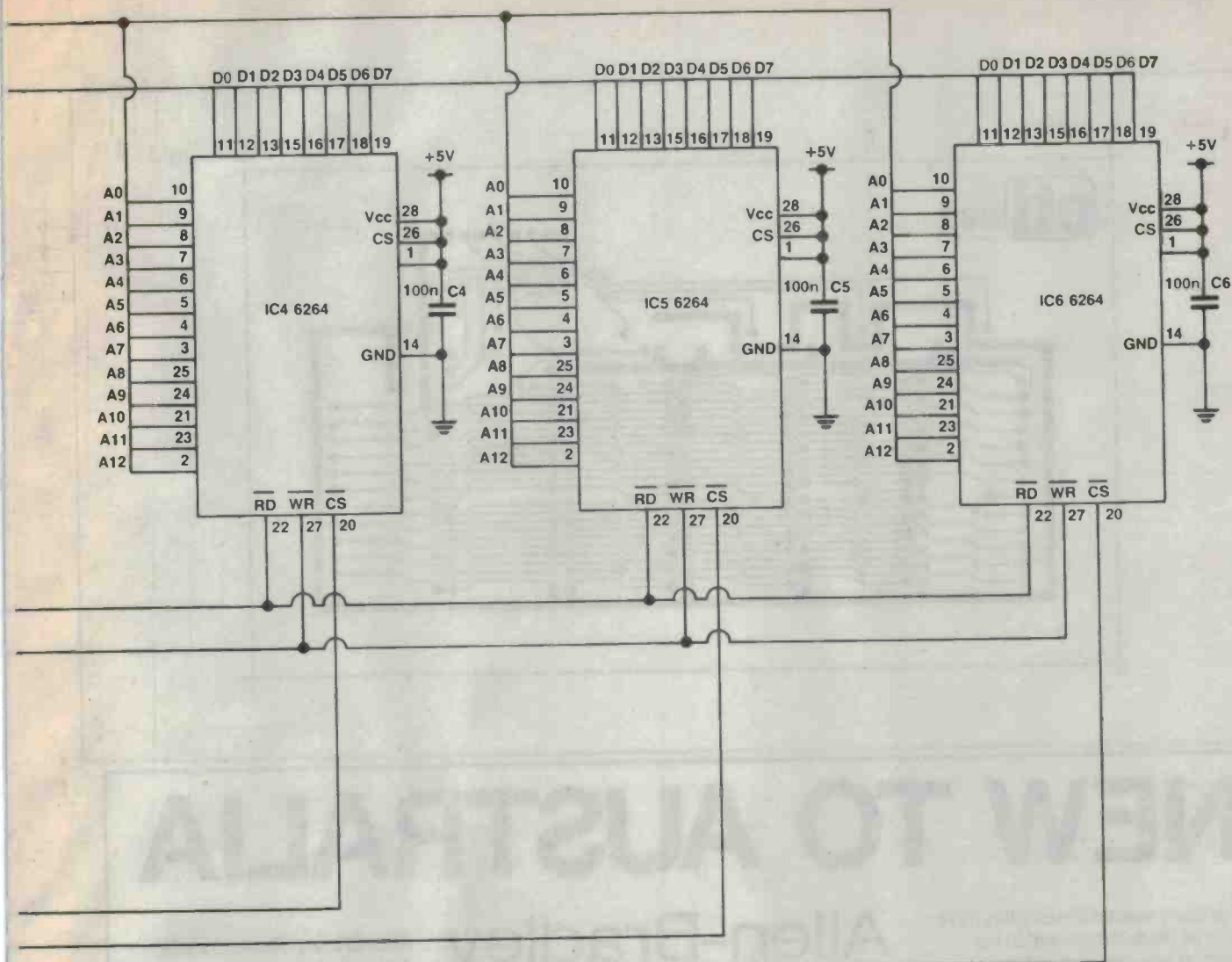


(See Figure 3 for the VCZ200 location. In the VZ300, the variable capacitor is located inside an rf shield to the right of the CPU. In both cases, a hole has been punched in the rf shield for access.)

2. The CPU can run at 4.433MHz by lifting pin 6 of the Z80A CPU and adding the clock circuit shown in Figure 4. The switch can be mounted on the top of the box. The speed change will affect tape operation, as this is controlled by the CPU. However, disk operations are unaffected and most programs will run somewhat faster. Do not change over the switch, however, unless the WAIT switch (see below) is depressed simultaneously, or no power is applied. The Z80 does not like its clock signal to be interfered with!

3. WAIT. Providing that no dynamic RAM is used (apologies to VZ300 and commercial RAM module users as these depend on the CPU for refresh signals), a pushbutton between pin 24 of the Z80 and ground will cause the CPU to halt while the key is depressed. Not only will this help the speed change circuit above, but the CPU can be stopped at any time (even at a critical stage in a game!) without affecting the software (except that dynamic RAM will clear).

4. RESET. Locate the 10μF capacitor on the 74LS04 (see Figure 3; this is the same IC as is used for the clock signal). Connect a pushbutton across this capacitor. When the button is depressed, the capacitor will discharge, causing a reset signal on the CPU. This has the advantage of resetting without



KEYBOARD SOCKET CONNECTIONS

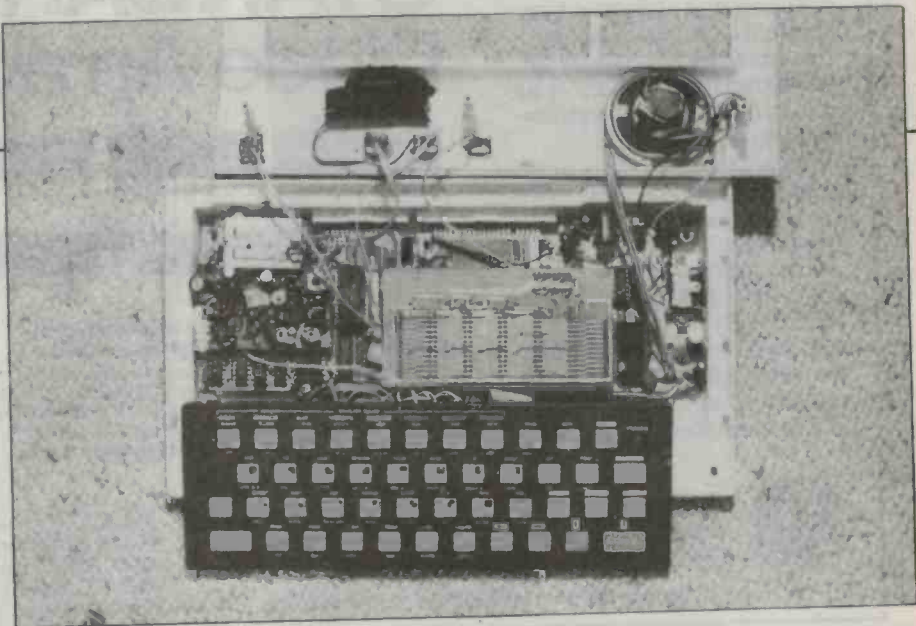
Socket: SK7/SK9/SK11 SK8/SK10/SK12

| Pin Number: | | |
|-------------|------|--------|
| 1 | A15 | MREQ |
| 2 | A13 | A12 |
| 3 | A14 | A11 |
| 4 | +5V | A7 |
| 5 | A8 | A6 |
| 6 | A9 | A5 |
| 7 | WR | A4 |
| 8 | RD | A3 |
| 9 | A10 | A2 |
| 10 | 78XX | A1 |
| 11 | D7 | A0 |
| 12 | D6 | D0 |
| 13 | D5 | D1 |
| 14 | D4 | D2 |
| 15 | D3 | GROUND |

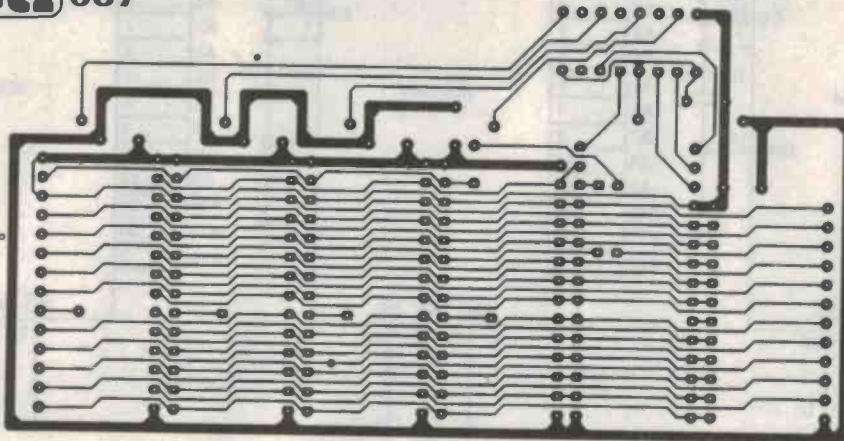
losing the memory, although all the program pointers will need to be adjusted. It is also somewhat kinder to the computer than turning off and on again.

5. Power supply. I have found that the power supply runs far too hot for my liking. Therefore, I mounted a 78H05 on a heat-sink on the top right of the case, removed the present 7805 and heatsink, and wired the 78H05 in its place. Not only does the computer now run cooler, it no longer packs up when all my peripherals are connected!

The memory board mounted upside down inside the VZ200 case.



eti 687

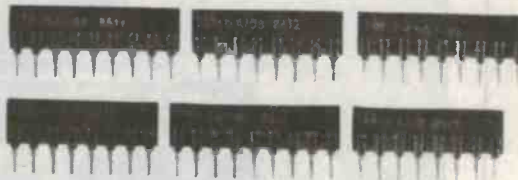


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